METHOD FOR PRODUCING A SHEET BY CARTER IN DEEP DRAWING The invention concerns a process for the manufacture by deep drawing a sheet metal casing for a pump comprising piston rotating inside the casing, including a pump pallets, sheet metal casing which is shaped like a cylindrical cup with a flange in a radial plane on the edge of the bowl.

The various stages of deep drawing are known eg "Handbuch der Fertigungstechnik", volume 2 / 3: Umformen und Zerteilen, 1985, edited by Günter Spur, Dieter Schmoeckel, and by "Taschenbuch Umformtechnik: Verfahren, Maschinen, Werkzeuge ", 1977, Heinz Tschàtsch.

The deep drawing process is particularly interesting in the cost for manufacturing parts used in large quantities.

We know for example the document DE-OS 36 37 229 vane pump with a casing bowl-shaped circular cylindrical with a flange arranged at right angles to it. The housing comprises a front wall on which the cylindrical hollow circular base is mounted tight through flange. The perfect operation of vacuum pumps pallets is ensured only when the front wall form the inner wall of the bowl a right angle with a sharp edge. Because of rounding radii obtained with the deep-drawing, it was not possible so far to make housings for pumps pallets using the deep drawing process.

The objective of the invention is achieved by deep drawing a housing for a vane pump which comprises a cylindrical bowl and a flange disposed at right angles on the edge of the bowl. The problem is solved in accordance with the invention by the fact that, following the phase of deep drawing, which was formed with the toilet flange is carried out during a phase of drawing by turning Annulare a ridge on the edge of the bowl which project axially from the plan of the bride, that by maintaining the flange and by blocking the outer diameter of the rim, it pushes the bead axially in the direction of the plane of the flange so that the material of the pad is pushed into the area from the edge of the bowl and forms a board mainly to sharp edges, without rounding radius. This solution is applicable to all cylindrical housings, not only to cylindrical housings circular base. Refer to it for example forms of housing according to DE 38 13 132 Al

According to a refinement of the invention, after the removal of the bead in the direction of the plane of the bride, is removed by machining the thickness of the pad remaining essentially plan until or beyond the flange. Thus it is possible to eliminate the rounding residual, removal of material necessary to obtain a sharp edge to the edge of the basin is low, however.

It is described below an example of realization of the invention referring to drawings.

These Figure 1 shows a cut of an axial vane pump 2 contained a cut of a radial vane pump 3 included a cut axial Crankcase complete Figure 3, a housing 4 obtained by a method of deep drawing current (detail) - fig. 3 draft; Fig. 4: machined Figures 5A to 5F phases of the process according to the invention Figures 6A to 6D phases forming as figures 5E, 5F Figure 7 crankcase machining completed according to Figure 6, Figure # 8A, 8B variants in Figure 6.

Vane pump 1 according to Figures 1, 2 is used as a vacuum pump and is driven by the engine of a motor vehicle. As a first step, we will describe the basic construction of the pump with the help of Figures 1, 2.

The rotor 11 is mounted mobile in rotation inside the pump casing and is connected by the shaft 3, through suitable gearing, the engine of the vehicle. The rotor 11 and shaft 3 are made in one piece. The rotor 11 is fitted over the entire axial length of a radial slit. The two pallets 17, 18 are guided in the sliding slot. The document DE-OS 35 07 176 for example shows the construction of these pallets. Refer to this document. The pump includes, in the direction of rotation indicated, an outlet orifice 15 and a suction hole 16. The two holes are each equipped with a non-return valve with a flow direction of the suction side to side return.

As noted above, the rotor is made of one piece with the shaft 3. The tree is mounted in a bearing 5 in the bearing housing 7. The casing consists of the pump casing 6 shaped bowl and a faceplate 8. The housing 6 shaped bowl has a flange 9, whereby it is clamped on the faceplate 8. We note that the palettes 17, 18 can not ensure the tightness of cells formed at the periphery of the rotor 11 where the annular ridge 4, 9 between the flange of a cylindrical casing and the other 6 is not strong, ie not perpendicular, axial cross section.

Figure 3 shows the area of the circular edge 4 between the envelope of the cylindrical casing 6 and the flange 8 to the form of maps which can be obtained by deep-drawing tradition. The result, at the edge 4, a rounding with a radius very important. Figure 3 also shows the angle of the pallet 17. The triangular window formed between the radius and rounding the edge of the pallet allows the flow of air in the compression side to the suction side.

Figure 4 shows the same area of the crankcase 6 and the flange 8, the flange 8 is machined to a plane 29 by a process of machining by chip removal. In this case, it is not possible to prevent a triangular window with a right hand corner equal to delta L and the other side of right angle equal to delta R remains in the area of the edge between the back side and suction side.

Figure 5 shows, in Sequence A to F, changes to the process of deep drawing according to the invention.

In Figure SA on the first pass produces no greenhouse flank. The sidewall 20 shaped plate is deformed by the punch 22 in the matrix taper 27 to provide a conical piece. A second pass is made in Figure 5B. According to figure 5C additional pass is made with the punch 22. The flange 8 of the sidewall 20 is pressed on the matrix 27.

A new password is performed in Figure 5D with greenhouse sidewall 21 in a matrix 23 and open clamp with the substance of the draft-shaped bowl from a mobile background matrix 26 and the front face of the punch 22.

During the phase of drawing by turning as shown in Figure 5E, the matrix is replaced by a drawing punch by turning 23. It is characterized by a circular rim 28 at its entrance that extends in the axial direction. The flange 9 of the draft so far is 20, which located in a radial plane, is applied to the rim. It then performs a pass by turning the glass side with 21, which serves here as a matrix. This matrix is made so that its inside diameter matches the outer diameter of the rim 28 of the stamping punch rollover while taking account of the thickness of the sheet. During this process of drawing by turning the draft is held by the stamping punch 22 and bottom 26 mobile matrix applied on the merits. The flange 9 is distorted in another radial plane determined by the stamping punch by turning 23. A bead is formed in the flange 9 of the draft 20 in the area of the circular edge 4 or the flange 9 is pushed beyond the plane of the rim. This gives the rim of the flange located axially above the radial plane of the flange 9.

Comes a process of extrusion. The cylindrical portion of the draft is still held by the punch deep drawn 22 and bottom 26 mobile matrix in the matrix or punch stamping by turning 23. In the annular space between the side glass or matrix stamping punch 21 and drawing 22 to move a rammer 25, which applies pressure on the rim 29 such that the material from which the rim edge in the flue 4 between the circular flange 8 and the cylindrical bowl 6.

The process of formation of the rim as shown in Figure 5E and return the bead shown in Figure 5F are again explained by referring to Figures 6A to 6C.

The draft shaped bowl fitted with the flange 9 is placed in the stamping punch by turning 23 so that the flange 9 rests on the ridge forming protrusion 28 in the axial direction of the stamping punch by turning 23. The draft is held by the punch of deep drawing and the bottom 22 of matrix 26 in the mobile stamping punch by turning 23. The matrix 21 is then lowered on the flange 9. The matrix 21 leaving a free annular space between it and the punch deep drawing of 22 with an outside diameter essentially corresponds to the outer diameter of the rim 28 of the stamping punch by turning 23. In addition, the shape of the matrix 21 ring-shaped oriented rim 28 is substantially adapted to the external shape of the radial ridge 28.Lors of lowering the matrix 21, the flange 9 is pressed into another level radially around the rim 28 until it comes into contact on the front surface of the stamping punch by turning 23. This phase is represented in Figure 6B. In this way, a circular pad is made on the draft in the area of the rim 4.

During the compression-extrusion below, the draft remains held in the stamping punch by turning the punch by 23 deep drawn 22 and bottom 26 mobile matrix. The ridge formed by the outline in the area of the circular edge 4 is always supported by the rim 28 of the stamping punch by turning 23. The flange 9 is applied by a side glass 21 on the punch stamping by turning 23. The greenhouse annular sidewall 21 has an internal diameter slightly larger. It is also possible to use the matrix 21 used in the phase of drawing by turning as previous greenhouse flank, which adapts to the rim with its tour to the rim 28 by taking the thickness of the sheet. A rammer 25 moves in the annular space between the side glass or matrix 21 and punch deep drawn 22. When using the glass side with an inner diameter enlarged, the rammer 25 is fitted on its front face turned toward the rim of a circular edge, which fits substantially radially to the outer rim. By the application of the rammer 25, the ridge formed at the edge 4 of the draft circular is distorted so that the material substantially fills the angle between the rammer 25 and punch 22. You get a great angle in the circular edge 4, which angle can be achieved in the acute form by a process of deep drawing current.

The height B of this edge in the direction of removal of a part determines the quantity of matter which is suppressed in the circular edge 4 between the deep drawing punch 22 and rammer 25, thus forming an edge angle significantly law and, secondly, the height of a ridge that remains after pressing. The height B of the edge of the rammer is very important for the formation of the circular edge 4 with an angle as great as possible.

Figures 8A and 8B show alternative phases 6C and 6D the use of a greenhouse sidewall 21 having an inner diameter substantially corresponds to the outer diameter of the bead formed on the draft. It is crucial to the success of the process according emboutissagerefoulement Figures 6C, 6D and 8A, 8B that the ridge formed on the draft can not influence radially outward. Creep must be essentially axially and radially inward.

During the phase shown in Figure 5F and 6D or circular ridge formed essentially an angle vif. The fact that this angle is sufficient depends both on the use and, secondly, the different parameters of the process of deep drawing. A final machining by chip removal may be necessary.

Figure 7 shows the finished machining the deck.

The flange 9 has been machined by a process for removing chips, in particular by grinding, to plan the final flange 29. The removal of material necessary delta L is significantly smaller than the removal of material visible in Figure 4 a housing stamped current, since to get a sharp edge with an embossed cover current, as shown in Figure 4, the thickness of the layer to remove the flange is significantly important Radii obtained with deep-drawing power. In a casing stamped by the invention, the total thickness of the layer of material to be removed is significantly lower since it is the rounding radius much smaller. In addition, it eliminates the first A of the pad thickness remaining, and which has an outer diameter smaller than the whole of the bride. Thus, in money, the amount of material removed is relatively low.